

# DOCUMENT RESUME

ED 190 877

CE 026 562

**TITLE** Military Curricula for Vocational & Technical Education. Basic Electricity and Electronics Individualized Learning System. CANTRAC A-100-0010. Progress Check Module. Progress Check Booklet.

**INSTITUTION** Chief of Naval Education and Training Support, Pensacola, Fla.: Ohio State Univ., Columbus. National Center for Research in Vocational Education.

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**IDENTIFIERS** Military Curriculum Project

## ABSTRACT

This document contains student progress checks designed for use with individualized modules 1-14 in the military-developed course on basic electricity and electronics. The course is one of a number of military-developed curriculum packages selected for adaptation to vocational instructional and curriculum development in a civilian setting. One progress check is provided for each lesson in the modules. Answers are included at the conclusion of each module. (L 4)

\*\*\*\*\*  
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 \*\*\*\*\*

### MILITARY CURRICULUM MATERIALS

The military-developed curriculum materials in this course package were selected by the National Center for Research in Vocational Education Military Curriculum Project for dissemination to the six regional Curriculum Coordination Centers and other instructional materials agencies. The purpose of disseminating these courses was to make curriculum materials developed by the military more accessible to vocational educators in the civilian setting.

The course materials were acquired, evaluated by project staff and practitioners in the field, and prepared for dissemination. Materials which were specific to the military were deleted, copyrighted materials were either omitted or approval for their use was obtained. These course packages contain curriculum resource materials which can be adapted to support vocational instruction and curriculum development.

## Military Curriculum Materials Dissemination Is . . .

an activity to increase the accessibility of military-developed curriculum materials to vocational and technical educators.

This project, funded by the U.S. Office of Education, includes the identification and acquisition of curriculum materials in print form from the Coast Guard, Air Force, Army, Marine Corps and Navy.

Access to military curriculum materials is provided through a "Joint Memorandum of Understanding" between the U.S. Office of Education and the Department of Defense.

The acquired materials are reviewed by staff and subject matter specialists, and courses deemed applicable to vocational and technical education are selected for dissemination.

The National Center for Research in Vocational Education is the U.S. Office of Education's designated representative to acquire the materials and conduct the project activities.

### Project Staff:

Wesley E. Budke, Ph.D., Director  
National Center Clearinghouse  
Shirley A. Chase, Ph.D.  
Project Director

## What Materials Are Available?

One hundred twenty courses on microtiche (thirteen in paper form) and descriptions of each have been provided to the vocational Curriculum Coordination Centers and other instructional materials agencies for dissemination.

Course materials include programmed instruction, curriculum outlines, instructor guides, student workbooks and technical manuals.

The 120 courses represent the following sixteen vocational subject areas:

Agriculture	Food Service
Aviation	Health
Building & Construction	Heating & Air Conditioning
Trades	Machine Shop Management & Supervision
Clerical Occupations	Meteorology & Navigation
Communications	Photography
Drafting	Public Service
Electronics	
Engine Mechanics	

The number of courses and the subject areas represented will expand as additional materials with application to vocational and technical education are identified and selected for dissemination.

## How Can These Materials Be Obtained?

Contact the Curriculum Coordination Center in your region for information on obtaining materials (e.g., availability and cost). They will respond to your request directly or refer you to an instructional materials agency closer to you.

### CURRICULUM COORDINATION CENTERS

#### EAST CENTRAL

Rebecca S. Douglas  
Director  
100 North First Street  
Springfield, IL 62777  
217/782-0759

#### MIDWEST

Robert Patton  
Director  
1515 West Sixth Ave.  
Stillwater, OK 74004  
405/377-2000

#### NORTHEAST

Joseph F. Kelly, Ph.D.  
Director  
225 West State Street  
Trenton, NJ 08625  
609/292-6562

#### NORTHWEST

William Daniels  
Director  
Building 17  
Airdustrial Park  
Olympia, WA 98504  
206/753-0879

#### SOUTHEAST

James F. Shill, Ph.D.  
Director  
Mississippi State University  
Drawer DX  
Mississippi State, MS 39762  
601/325-2510

#### WESTERN

Lawrence F. H. Zane, Ph.D.  
Director  
1776 University Ave.  
Honolulu, HI 96822  
808/948-7834

## The National Center Mission Statement

The National Center for Research in Vocational Education's mission is to increase the ability of diverse agencies, institutions, and organizations to solve educational problems relating to individual career planning, preparation, and progression. The National Center fulfills its mission by:

- Generating knowledge through research
- Developing educational programs and products
- Evaluating individual program needs and outcomes
- Installing educational programs and products
- Operating information systems and services
- Conducting leadership development and training programs

### FOR FURTHER INFORMATION ABOUT Military Curriculum Materials

#### WRITE OR CALL

Program Information Office  
The National Center for Research in Vocational  
Education  
The Ohio State University  
1960 Kenny Road, Columbus, Ohio 43210  
Telephone: 614/486-3655 or Toll Free 800/  
848-4815 within the continental U.S.  
(except Ohio)



## Military Curriculum Materials for Vocational and Technical Education

Information and Field  
Services Division

The National Center for Research  
in Vocational Education



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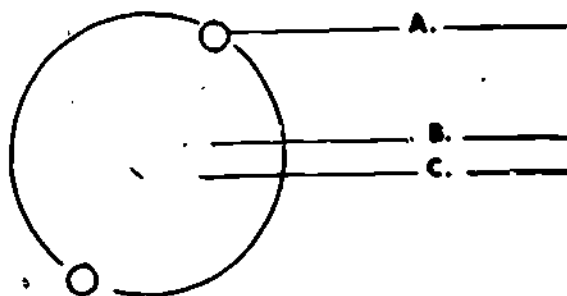
## LESSON PROGRESS CHECKS

Record your answers in the spaces provided. When you have completed a lesson progress check, compare your answers to the correct answers. The correct answers are located at the end of each module along with blank pages for notes.

IF YOUR ANSWERS ARE ALL CORRECT, GO ON TO THE NEXT LESSON. IF NOT, STUDY ANY OF THE OTHER RESOURCES AVAILABLE FOR THAT LESSON UNTIL YOU CAN ANSWER ALL THE QUESTIONS CORRECTLY.

PROGRESS CHECK  
LESSON 1Electricity and the Electron

1. Label the three particles indicated.



2. If a neutral atom contains 10 protons and 14 neutrons, it should contain:

- ☐ a. 24 electrons.  
☐ b. 10 electrons.  
☐ c. 14 electrons.

3. The atomic particles which orbit the nucleus are:

- ☐ a. protons.  
☐ b. neutrons.  
☐ c. electrons.

4. The nucleus of an atom is composed of:

- ☐ a. electrons and neutrons.  
☐ b. protons and electrons.  
☐ c. protons, electrons, and neutrons.  
☐ d. neutrons and protons.

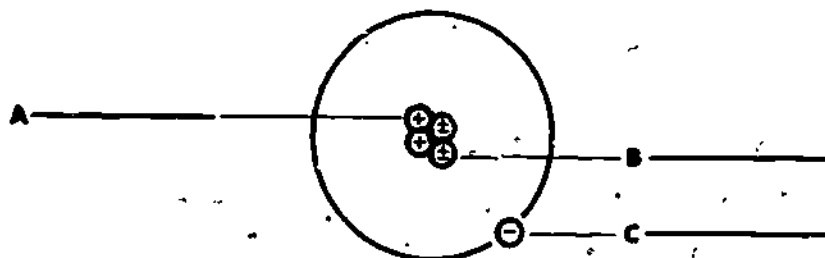
5. Protons and electrons normally are:

- ☐ a. equal in number.  
☐ b. equal in size and weight.  
☐ c. found in the nucleus.

PROGRESS CHECK  
LESSON 11

Electron Movement

1. Label the atomic particles.



2. State the Law of Charged Bodies:

---



---

3. Match.

- \_\_\_ 1. two protons
- \_\_\_ 2. proton and electron
- \_\_\_ 3. (+) and (-).
- \_\_\_ 4. two electrons
- \_\_\_ 5. positive and negative
- \_\_\_ 6. (+) and (+)
- \_\_\_ 7. like charges
- \_\_\_ 8. unlike charges
- \_\_\_ 9. negative and negative
- \_\_\_ 10. positive and positive
- \_\_\_ 11. two neutrons

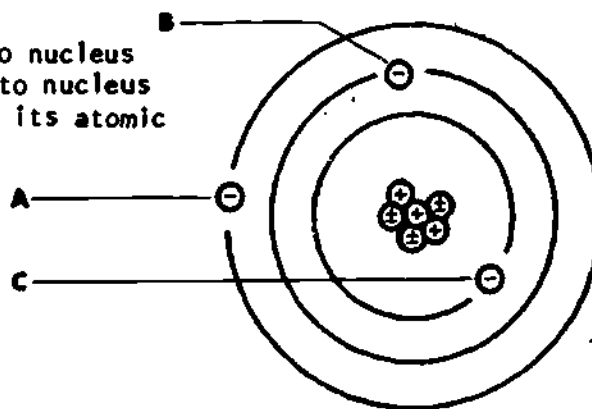
a. attraction

b. repulsion

c. neither

4. Match.

- \_\_\_ 1. weakest attraction to nucleus
- \_\_\_ 2. greatest attraction to nucleus
- \_\_\_ 3. easiest to free from its atomic orbit



5. Which correctly describes "random drift?"

- ☐ a. the general movement of electrons in one direction through a wire.
- ☐ b. the occasional straying of electrons from one nuclear orbit to another in the same atom.
- ☐ c. the undirected movement of free electrons in a wire.
- ☐ d. the haphazard movement of atoms in a wire.

6. Which correctly describes "free electrons?"

- ☐ a. electrons which are no longer attached to an atom.
- ☐ b. electrons which make up the outermost shell of an atom.
- ☐ c. electrons which have become attached to another atom's nucleus.

7. When an electron is removed from a neutral atom the atom becomes a/an:

- ☐ a. negative ion.
- ☐ b. positive ion.
- ☐ c. uncharged ion.
- ☐ d. free ion.

8. The energy required to free an electron from its parent atom is known as:

- ☐ a. potential energy.
- ☐ b. atomic energy.
- ☐ c. ionization potential.
- ☐ d. electromotive force.

Sound/Slide  
Constructing a Simple Circuit

Self-Test  
Module One - Lesson III

1. In the simple circuit, what device acts as the source?

Answer \_\_\_\_\_

2. What device acts as the load?

Answer \_\_\_\_\_

3. What is the function of the source?

Answer \_\_\_\_\_

4. In a de-energized circuit, the switch is in the open / closed position.

5. The "blueprint" or plan used for constructing a simple circuit is called a \_\_\_\_\_ diagram.

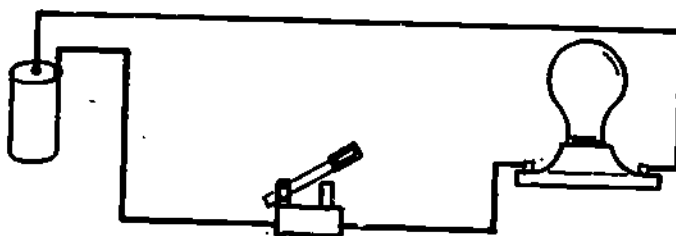
6. The negative terminal of a dry cell is the terminal on the outer edge/ of the cell.  
in the center

7. When wiring a circuit, the switch should be open/closed.

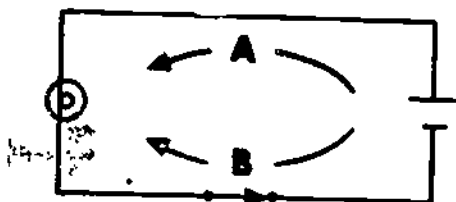
1. a cell or battery; 2. a lamp; 3. provides the force that causes current to flow; 4. opens; 5. schematic; 6. on the outer edge; 7. open

PROGRESS CHECK  
LESSON IIICurrent Flow

1. Draw a schematic of the circuit shown below.



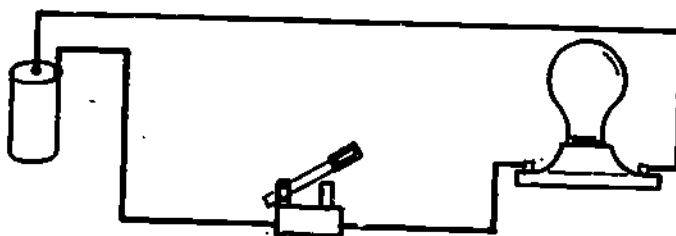
2. Which arrow correctly shows the direction of current flow?



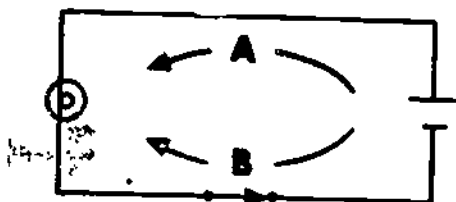
3. Which correctly describes electron current flow?
- ☐ a. free electrons moving in one direction.
  - ☐ b. the directed drift of positive and negative charges through a wire.
  - ☐ c. the drifting of outermost electrons away from their atomic nuclei.
  - ☐ d. the random drift of electrons in a conductor.

PROGRESS CHECK  
LESSON IIICurrent Flow

1. Draw a schematic of the circuit shown below.



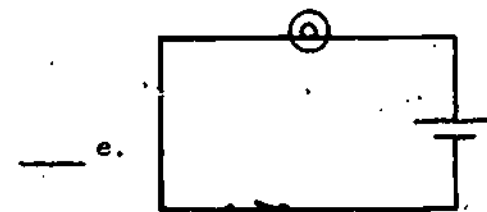
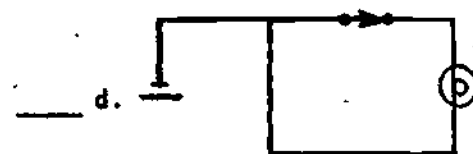
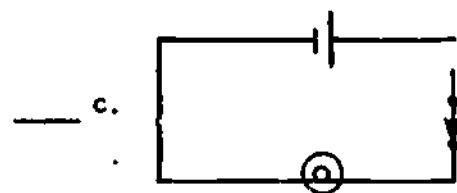
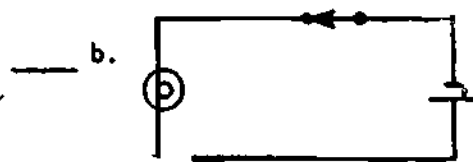
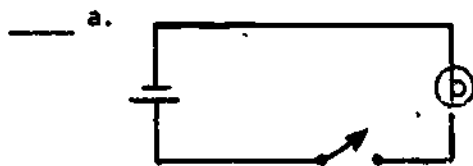
2. Which arrow correctly shows the direction of current flow?



3. Which correctly describes electron current flow?
- ☐ a. free electrons moving in one direction.
  - ☐ b. the directed drift of positive and negative charges through a wire.
  - ☐ c. the drifting of outermost electrons away from their atomic nuclei.
  - ☐ d. the random drift of electrons in a conductor.



4. In which circuit will current flow?



# Progress Check

One-III

## 5. Match.


- \_\_\_ 1. cell
- \_\_\_ 2. switch
- \_\_\_ 3. lamp
- \_\_\_ 4. conductor

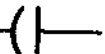
a. \_\_\_\_\_

b. 

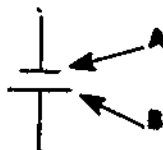
c. 

d. 

e. 

f. 

## 6. Which arrow points to the negative terminal? \_\_\_\_\_



## 7. Which statement(s) is/are true?

- \_\_\_ a. Current will not flow in a circuit unless there is a complete path.
- \_\_\_ b. When a circuit is closed, there is an incomplete path.
- \_\_\_ c. A circuit is open when there is an incomplete path.
- \_\_\_ d. Current flow in a conductor is from positive to negative.

Progress Check

One-IV

6. Convert to amperes (use scientific notation).

- a. 20 ma
- b. 4 ma
- c. 5  $\mu$ a
- d. 30  $\mu$ a

7. Convert to microamperes (use scientific notation).

- a. 0.003 a
- b. 0.010 a
- c. 0.000004 a
- d. 0.000020 a

Sound/Slide

The Ammeter

Self-Test

Module One - Lesson V

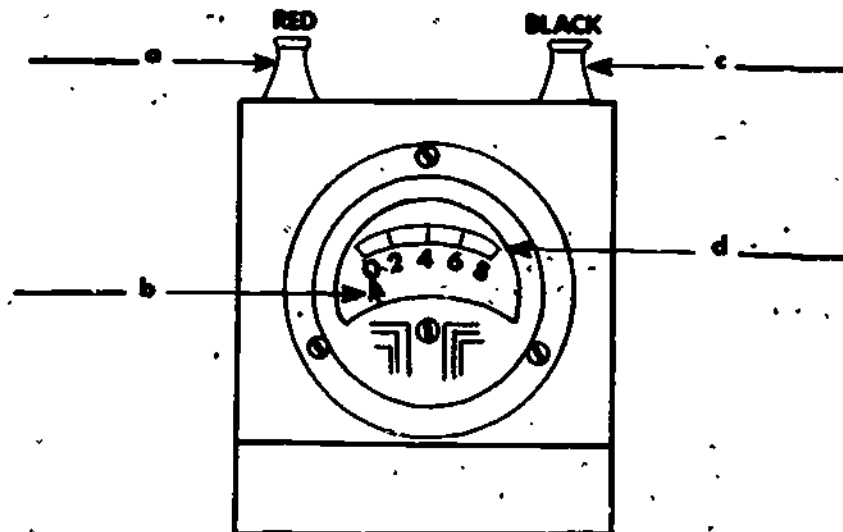
1. The unit of measure for current is the \_\_\_\_\_.
2. On an ammeter, the black terminal is \_\_\_\_\_ and the red terminal is \_\_\_\_\_.
3. What indicates that an ammeter is connected with incorrect polarity?  
Answer: \_\_\_\_\_
4. When an ammeter is to be connected into a circuit, the first step is \_\_\_\_\_.
5. When an ammeter is properly connected into a simple circuit, the meter is connected so that:
  - a. only a small amount of the total current will pass through the meter.
  - b. all of the current flowing in the circuit will pass through the meter.Answer: \_\_\_\_\_
6. A milliamperere is equal to \_\_\_\_\_ ampere(s).
7. The name for one millionth of an ampere is one \_\_\_\_\_ ampere.
8. It is good practice to select a meter having a range \_\_\_\_\_ greater/smaller than you expect to measure.

1. ampere; 2. negative, positive (in that order); 3. The pointer will deflect in the wrong direction; 4. de-energize the circuit; 5. b; 6. 1/1000; 7. micro; 8. greater


# PROGRESS CHECK LESSON V

## The Ammeter

1. Label the parts of the ammeter.

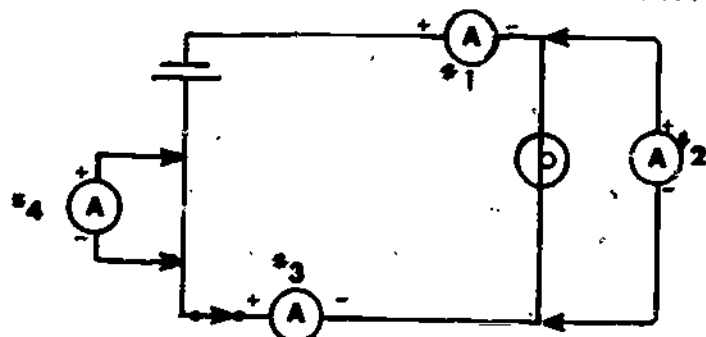


2. Which statement(s) is/are true?

- ☐ a. The basic unit of electron current is the ampere.
- ☐ b. When measuring current, the ammeter must be connected in parallel.
- ☐ c. The ammeter is used to measure coulombs per second and is represented schematically by .
- ☐ d. Polarity must be observed when connecting the ammeter into the circuit.
- ☐ e. Current readings will be higher when the ammeter is connected near the negative terminal of the cell than when connected near the positive terminal.

3. Which meter is properly connected for taking current measurements?

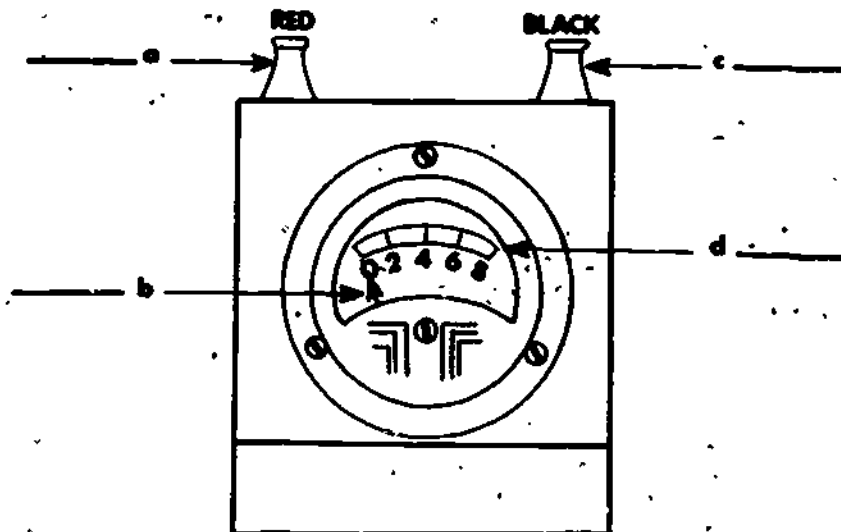
- ☐ a. Meter #1
- ☐ b. Meter #2
- ☐ c. Meter #3
- ☐ d. Meter #4




# PROGRESS CHECK LESSON V

## The Ammeter

1. Label the parts of the ammeter.

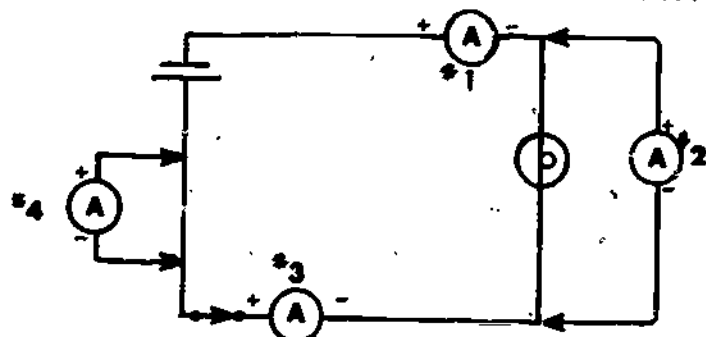


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3. Which meter is properly connected for taking current measurements?

- ☐ a. Meter #1
- ☐ b. Meter #2
- ☐ c. Meter #3
- ☐ d. Meter #4



**PROGRESS CHECK ANSWERS**  
**MODULE ONE**

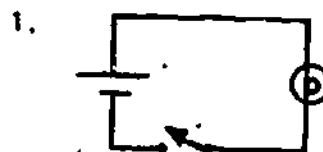
**LESSON I**

1. a. electron  
b. neutron  
c. proton
2. b
3. c
4. d
5. a
6. c
7. c, e

**LESSON II**

1. a. proton  
b. neutron  
c. electron
2. Like charges repel and unlike charges attract.
3. 1-b 7-b  
2-a 8-a  
3-a 9-b  
4-b 10-b  
5-a 11-c  
6-b
4. 1-a  
2-c  
3-a
5. c
6. a
7. b
8. c

**LESSON III**



2. b
3. a
4. e
5. 1-e  
2-d  
3-c  
4-a
6. a
7. a, c

**LESSON IV**

1. 6,250,000,000,000,000,000 or  $6.25 \times 10^{18}$  electrons
2. b
3. b
4. a.  $2.1 \times 10^2$   
b.  $4.31 \times 10^{-2}$   
c.  $8.3 \times 10^4$   
d.  $1 \times 10^{-3}$
5. a. 1000  
b. 0.1  
c. 0.001  
d. 100,000
6. a.  $2 \times 10^{-2} \text{ a}$   
b.  $4 \times 10^{-3} \text{ a}$   
c.  $5 \times 10^{-6} \text{ a}$   
d.  $3 \times 10^{-5} \text{ a}$
7. a.  $3 \times 10^3 \mu\text{a}$   
b.  $1 \times 10^4 \mu\text{a}$   
c.  $4 \times 10^0 \mu\text{a}$   
d.  $2 \times 10^1 \mu\text{a}$



**PROGRESS CHECK ANSWERS**  
**MODULE ONE**

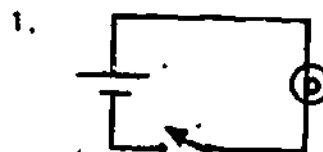
**LESSON I**

1. a. electron  
b. neutron  
c. proton
2. b
3. c
4. d
5. a
6. c
7. c, e

**LESSON II**

1. a. proton  
b. neutron  
c. electron
2. Like charges repel and unlike charges attract.
3. 1-b 7-b  
2-a 8-a  
3-a 9-b  
4-b 10-b  
5-a 11-c  
6-b
4. 1-a  
2-c  
3-a
5. c
6. a
7. b
8. c

**LESSON III**



2. b
3. a
4. e
5. 1-e  
2-d  
3-c  
4-a
6. a
7. a, c

**LESSON IV**

1. 6,250,000,000,000,000,000 or  $6.25 \times 10^{18}$  electrons
2. b
3. b
4. a.  $2.1 \times 10^2$   
b.  $4.31 \times 10^{-2}$   
c.  $8.3 \times 10^4$   
d.  $1 \times 10^{-3}$
5. a. 1000  
b. 0.1  
c. 0.001  
d. 100,000
6. a.  $2 \times 10^{-2}$  a  
b.  $4 \times 10^{-3}$  a  
c.  $5 \times 10^{-6}$  a  
d.  $3 \times 10^{-5}$  a
7. a.  $3 \times 10^3$   $\mu$ a  
b.  $1 \times 10^4$   $\mu$ a  
c.  $4 \times 10^0$   $\mu$ a  
d.  $2 \times 10^1$   $\mu$ a

LESSON V

1. a. positive terminal  
b. pointer (needle)  
c. negative terminal  
d. meter dial (scale)
  2. a, c, and d
  3. c
  4. b
  5. About 0.2 amps
- 

IF YOUR ANSWERS ARE ALL CORRECT, YOU MAY TAKE THE MODULE TEST. IF NOT, STUDY ANY OF THE OTHER RESOURCES AVAILABLE FOR THIS LESSON BEFORE TAKING THE PROGRESS CHECK AGAIN.



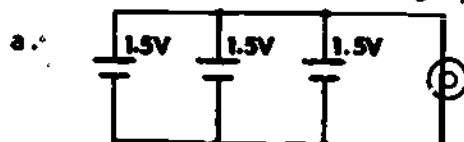




# Progress Check

Two-1

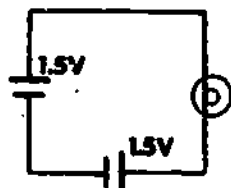
3. Identify the kind of cell connection used in each circuit and the amount of voltage being applied to the lamp.



cell connection: \_\_\_\_\_

voltage at lamp: \_\_\_\_\_

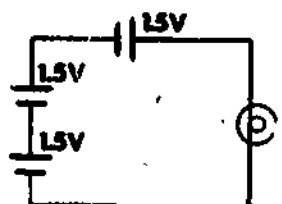
b.



cell connection: \_\_\_\_\_

voltage at lamp: \_\_\_\_\_

c.



cell connection: \_\_\_\_\_

voltage at lamp: \_\_\_\_\_

4. Which statement(s) is/are true?

- \_\_\_\_\_ a. Terminals of the opposite polarity are connected together in a series aiding connection.  
 \_\_\_\_\_ b. Terminals of the same polarity are connected together in a series opposing connection.  
 \_\_\_\_\_ c. Both.  
 \_\_\_\_\_ d. Neither.

5. Which statement(s) about electromotive force is/are true?

- \_\_\_\_\_ a. EMF is a force which tends to move electrons.  
 \_\_\_\_\_ b. EMF is the same as voltage.  
 \_\_\_\_\_ c. EMF is generated by the chemical energy released as a result of mechanical work on the cell.  
 \_\_\_\_\_ d. EMF causes an accumulation of opposite charges on a cell's terminals.

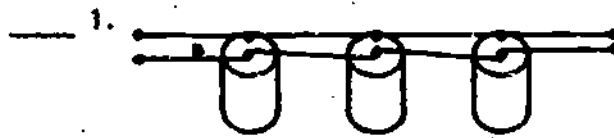
# Progress Check

Two-1

## 6. Match.

- |                              |         |
|------------------------------|---------|
| _____ 1. Voltage             | a. V    |
| _____ 2. Electromotive Force | b. E    |
| _____ 3. Volt                | c. E/IF |

## 7. Match.



- a. Series-aiding
- b. Series-opposing
- c. Parallel

